Claims:

1. An ion implantation method, characterized in that the method comprises the steps of:

generating, by plasma generation means, plasma at least including implantation target ions and charged particles of a polarity opposite to that of the implantation target ions;

transporting the plasma onto a deposition-assistance substrate under an influence of a magnetic field;

giving acceleration energies to the implantation target ions by a bias voltage applied by the deposition-assistance substrate;

irradiating the plasma toward the deposition-assistance substrate; and

implanting the implantation target ions into a material film on the deposition-assistance substrate.

2. The ion implantation method of claim 1, characterized in that the bias voltage has a polarity opposite to that of the implantation target ions.

3. The ion implantation method of any one of claims 1 and 2, characterized in that the plasma is irradiated to the material film deposited on the deposition-assistance substrate, to implant the implantation target ions into the material film.

4. The ion implantation method of any one of claims 1 and 2, characterized in that the plasma is irradiated toward the deposition-assistance substrate simultaneously

with deposition of the material film onto the deposition-assistance substrate, to implant the implantation target ions into the material film.

5. The ion implantation method of any one of claims 1 and 2, characterized in that the implantation target ions are implanted into the material film by repeating:

a step of depositing a material film on the deposition-assistance substrate; and

the step of irradiating the plasma toward the deposition-assistance substrate.

6. The ion implantation method of any one of claims 1 through 5, characterized in that the ions are implanted into the material film comprising fullerene to produce containing-fullerene or hetero-fullerene.

7. The ion implantation method of claim 6, characterized in that the acceleration energies are within a range of 10 eV inclusive to 500 eV inclusive.

8. The ion implantation method of claim 6, characterized in that the acceleration energies are within a range of 20 eV inclusive to 500 eV inclusive.

9. The ion implantation method of any one of claims 1 through 5, characterized in that the material film is carbon nanotube, a material film of organic EL, a material film of solar cell, a material film of fuel cell, an organic semiconductor material film, or an electroconductive polymer material film.

10. The ion implantation method of claim 9,

characterized in that the acceleration energies are within a range of 0.5 eV inclusive to 500 eV inclusive.

11. The ion implantation method of any one of claims 1 through 10, characterized in that the implantation target ions have an ionic current density of 1 $\mu A/cm^2$ or more.

12. The ion implantation method of any one of claims 1 through 11, characterized in that the implantation target ions are implanted, by arranging a grid electrode in the plasma and separatedly from the deposition-assistance substrate to thereby control a plasma potential by a voltage applied to the grid electrode.

13. The ion implantation method of claim 12, characterized in that the grid electrode is located at a distance in a range of 1 mm inclusive to 50 mm inclusive from the deposition-assistance substrate.

14. The ion implantation method of any one of claims 1 through 13, characterized in that the implantation target ions are implanted, by providing the deposition-assistance substrate in a form of a plurality of divisional deposition-oriented plates in concentric circle shapes, and by independently controlling bias voltages applied to the plurality of deposition-oriented plates.

15. The ion implantation method of any one of claims 8 through 14, the implantation target ions are implanted, by cooling the deposition-assistance substrate by cooling means.

16. An ion implantation apparatus comprising:

a vacuum vessel;

plasma generation means for generating plasma at least including implantation target ions and charged particles of a polarity opposite to that of the implantation target ions, within said vacuum vessel;

magnetic field generating means;

a deposition-assistance substrate arranged within said vacuum vessel;

bias voltage application means for applying a bias voltage to said deposition-assistance substrate; and

material film deposition means for depositing a material film onto said deposition-assistance substrate.

17. An ion implantation apparatus comprising:

a vacuum vessel;

plasma generation means for generating plasma at least including implantation target ions and charged particles of a polarity opposite to that of the implantation target ions, within said vacuum vessel;

magnetic field generating means;

a deposition-assistance substrate arranged within said vacuum vessel; and

bias voltage application means for applying a bias voltage to said deposition-assistance substrate.

18. The ion implantation apparatus of any one of claims 16 and 17, characterized in that said deposition-assistance substrate comprises a conveyor or rotary cylinder.

19. The ion implantation apparatus of any one of claims 16 and 17, characterized in that said apparatus includes a transport device comprising a belt conveyor or rotary cylinder, and

that said transport device is configured to support and transport a plurality of said deposition-assistance substrates within said vacuum device.

20. The ion implantation apparatus of claim 19, characterized in that said deposition-assistance substrates are each supported to said transport device by an electroconductive clamp member.

21. The ion implantation apparatus of any one of claims 17 through 20, characterized in that said ion implantation apparatus further comprises cooling means for cooling said deposition-assistance substrate.